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AN EVALUATION OF DWARF MISTLETOE CONTROL PROJECTS ASHLEY NATIONAL FOREST

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INTRODUCTION

Lodgepole pine stands on the Ashley National Forest were evaluated for proposed dwarf mistletoe suppression projects, and post-control projects were inspected on August 25-27, 1987. Areas surveyed are located on the following Ranger Districts: Duchesne--South Fork Rock Creek; Roosevelt--Hominy Creek; Vernal--Dodds Hollow, Kaler Hollow, North Taylor Mountain, and Alma Taylor; and Flaming Gorge--Spirit Lake road/Hickerson Park.

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OBJECTIVES

The objectives of this evaluation are to provide recommendations for minimizing lodgepole pine (LPP) (*Pinus contorta*) losses to dwarf mistletoe (DM) (*Arceuthobium americanum*).

METHODS and RESULTS

The lodgepole pine regeneration units were walked through and visually surveyed for the presence of DM infected overstory, understory trees, and regeneration.

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EXPERIMENT STATION

Proposed Control Projects

Lodgepole trees in Stands 1 and 2 and Compartment 406, adjacent to the last mile of the South Fork Rock Creek road, contained numerous brooms. The proposed control treatment in this old sale area was to fell or girdle infected LPP overstory over LPP understory. Dwarf mistletoe plants were not located in this area. Plants were encountered below Stand 2. It is possible that the LPP in Stands 1 and 2 are too high in elevation for development of DM and the brooms are caused by other factors (stimulation). Other areas on the Ashley NF with similar characteristics are located along Pole Mountain and near Paradise Park. If DM plants are located in Stands 1 or 2, this area should be re-evaluated by FPM.

The Alma Taylor wildlife habitat improvement project could provide DM control while meeting the primary objectives for the area. The continuous LPP stand is being broken up to increase forage/cover ratio through burning and timber harvesting. This multi-funded project could receive supplemental FPM funding on the proportion of the treatment area where DM is located. Approximately 60 percent of the plateau was burned in the early 1900's. Thick stands of LPP "dog hair" resulted and have become infected along the edges next to older infected LPP. The most effective treatment would be to create 20 acre clearcuts areas and schedule adjoining 20 acre clearcuts 10 years later. This area will be surveyed by FPM in 1988 to determine what percent of treatment area is infected.

Post Control Evaluation

Hominy Creek Salvage Sale: The DM control treatment using a firewood sale to remove infected LPP was effective in removing the larger overstory trees. A few infected LPP trees (7 - 21' tall and 1.5 - 8" DBH) were scattered throughout the unit and should be removed when the stand is thinned. Data collected prior to this project (R4-85-5) indicated six percent of the LPP trees less than 5" DBH were infected.

Dodds' Hollow: The control treatment, following recommendations in Evaluation R4-86-2, was effective. The 30-50' wide wall of LPP overstory trees between two clearcut units will continue to spread DM seeds into both units. This wall should be removed before the regeneration becomes infected.

Kaler Hollow: The infected overstory LPP trees have been removed. Any live girdled LPP need further treatment. Date collected prior to the overstory removal (R4-86-2) indicated that 56 percent of the understory (LPP < 6" DBH) was infected. The infection levels in the remaining understory should be reduced by sanitation thinning 5 years after the overstory was removed.

North Taylor Mountain: Units 3, 7, 8, and 9 have been treated properly for DM control as recommended in Evaluation R4-85-10. Units 1, 2, 12, and 15 will be completed later. Concerns in this area include: Small DM infected LPP "whips" which survive the piling operation will infect the regenerations if not treated; LPP trees girdled in the area and not dead need further treatment; Between unit 3 and the main road is a 30' wide strip of trees (along the historic road) containing a few DM infected LPP. If the LPP trees could be removed, the remaining non-host trees and the road would provide an excellent DM barrier.

Spirit Lake Road/Hickerson Park: The units look clean where the DM infected overstory LPP have been treated (following recommendations in the Evaluation R4-85-15), except for the occasional infected LPP tree over 5 feet tall missed during the sanitation treatment or "whips" surviving the piling operation. The District has attempted to treat any infected survivors they find. A few LPP with brooms were located, but no DM plants were found on or near the tree. Close inspection is needed to determine if brooms are caused by DM or stimulation.

Other DM Control Opportunities

Dwarf mistletoe infected lodgepole pine trees should be removed before the regeneration becomes infected in the following locations:

1. Along the Forest System Roads where narrow strips or pockets of dense LPP have been left to screen recent clearcuts or firewood sale areas from view.

2. On the edge of recent burns where scattered LPP survived next to natural barriers.

BIOLOGY OF PESTS

Dwarf Mistletoe (A. americanum). These parasitic seed-bearing plants establish themselves on the younger stems and branches of the host tree. Dwarf mistletoes are dioecious (male and female parts are on separate plants), perennial, and live only as parasites on living conifers. They absorb water, dissolved minerals, and photosynthates from the phloem and outer xylem tissues of the host tree. The principle host of this species is Pinus contorta, lodgepole pine.

Dwarf mistletoe spreads locally from tree to tree and to parts of the same tree by expulsion of seeds from mature fruits (berries). Most seeds fall within 10 to 15 feet (90 percent within one half chain (33 feet)), but can reach distances of up to 60 feet of the source tree. Spread is most efficient and rapid from an open infected overstory to a vigorous understory, and slower through single-storied stands at a rate of about 1 to 2 feet per year. Long distance spread may result from seed transport by birds and mammals.

The life cycle is 3 to 6 years from seed dispersal, germination, infection, establishment of new plants, flowering, to seed dispersal. Detection of incipient infection is difficult. Latent infections on healthy looking regeneration can appear 3 to 6 years after the host tree is removed. After all or a large part of an overstory is removed, the increased sunlight causes suppressed infections in the understory to flourish and intensify. Dwarf mistletoe development depends directly on the vigor of the host tree; the more vigorous the tree, the more vigorous the mistletoe. When the tree dies the mistletoe dies.

Dwarf mistletoe-infected trees can be recognized through a variety of host plant characteristics such as witches' brooms, cankers, swellings, basal cups, and other abnormalities on the trunk and branches. The dwarf mistletoe plants are visible on infected parts. Where the parasite has been present for a long

time, the stand may give the impression of poor site conditions. The stand will contain deformed, stunted, spike-topped, dying, and dead trees.

Damage by dwarf mistletoe falls into five general categories: reduced increment, lower timber quality, reduced seed production, increased mortality, and indirect losses. Indirect losses include increased susceptibility to insect attack, root diseases, and storm damage.

Environmental factors have an effect on the incidence and abundance of dwarf mistletoe. Low temperatures are presumed to be the primary factor limiting the distribution of DM in the higher elevations. A DM-free zone can be found consistently at altitudes from 200 to 600 feet below the upper limits of commercial lodgepole pine. This zone is relatively small, but should be considered when identifying DM infected trees only on the presence of brooms.

Stimulation brooms. These are the most common non-mistletoe brooms in lodgepole pine. These brooms are usually denser than DM brooms and will not have DM shoots or basal cups. They occur in formerly suppressed trees with few branches or trees with dead or injured crowns and are most common in residual trees left in cutover areas. The brooming is a result of increased growth concentrated in the remaining branches. Trees with brooms in the immediate vicinity of DM infected LPP should be considered infected.

MANAGEMENT RECOMMENDATIONS

It is Regional policy to take full advantage of timber sales, timber stand improvement programs, and reforestation programs to prevent or reduce resource impacts from DM. Because of the biology of DM, effective levels of management can be achieved by the orderly application of existing control procedures and techniques with standard silvicultural practices. Prevention is the principle means of reducing losses.

Clearcutting is the best way to control DM in mature lodgepole pine. This treatment should include the removal of all merchantable and non-merchantable LPP trees over 3 feet tall or the sanitation value of the operation will be lost. Trees over 3 feet could have latent or suppressed infections not visible at the time of treatment. The DM from the infected trees will continue to infect the remaining and future trees.

Clearcut units should be greater than 20 acres and regular in shape to maximize the area/perimeter ratio to prevent rapid reinvasion from infection sources on the edges. This is important for units where the stands surrounding the clearcuts cannot be cut until the regeneration is tall enough to provide suitable wildlife hiding cover (90 percent of the animal hidden from view at 200 feet). When the Forest Management Plan requires a clearcut to be less than 20 acres and/or in an irregular shape, DM will infect a greater portion of the unit from surrounding stands before the next rotation.

A circular clearcut without islands or peninsulas of infected trees is recommended. Long narrow strips should be avoided. Borders of clearcut units should incorporate natural and manmade barriers to prevent or slow reinvasion. Barriers can include small natural openings in stands, meadow edges, timber type species changes, uninfected edges of the same timber type, rock outcrops,

streams, lakes, roads, powerlines, and adjacent clearcuts. These barriers should be about one half chain (33 feet) wide. Clearcut boundaries should be located in bottoms rather than on ridges. If these clearcutting parameters cannot be met, then the infected boundaries should be moved back or removed before the regeneration is 3 feet tall or 10 years old, to minimize infection in the new reproduction.

Recent burns should be treated for DM control. Any live infected overstory trees remaining in and around the perimeter next to natural DM barriers should be removed to prevent reinfection.

In mature stands heavily infected by DM, any type of partial cutting, thinning, or cleaning is likely to intensify the infection and increase the growth loss as mentioned above. Dwarf mistletoe will begin to reduce the growth rate of trees which have a DMR of 3 or greater. A stand with an average DMR over 2 will begin to have significant losses due to growth loss and mortality. The stand DMR will increase about one DMR class every 14 years.

Do not confuse DM brooms with stimulation brooms caused by increased sunlight or comandra rust. Be aware of the zone where environmental factors could have an effect on the incidence and abundance of DM.

Approved Control Projects

Control of DM can be funded by timber sale, KV, Reforestation and Stand Improvement, and FPM funds (FSM 3462.14--2, 3/83 R-4 SUPP 3).

The following treatments will provide a clean stand during the next rotation.

I. Treatments funded by FPM (listed by priority)

A. Residual removal

1. Remove residuals and any pockets or islands of infected LPP trees within all clearcut units or burn areas where the regeneration is not infected (less than 3 feet tall or 10 years old).

2. Clean the infected LPP overstory surrounding clearcut units or burn areas between 10 and 20 acres in size where an adjoining clearcut will not be scheduled before the LPP regeneration is 3 feet tall or 10 years old. Treatment should not be an extension of the clearcut boundary. A sanitizing treatment (see I-4 below) should be scheduled 5 years after the clearcut to remove latent and suppressed infection.

Any of the following recommendations can be included:

a. Remove** infected LPP along the perimeter next to areas that can provide a barrier after their removal (ponds, open areas, roads, etc.).

b. Remove** or kill the infected LPP back 33 feet from the clear-cut edge where one half or more of the trees are non-host species. The remaining overstory trees provide a barrier from DM seeds. Trees should be removed during or just after the clearcut as a separate cutting treatment or killed before the regeneration becomes infected. This partial-cut type

procedure will soften the straight edge between the clearcut and uncut forest to create a feathering effect.

c. Remove** scattered infected LPP along the perimeter to create an even edge next to the regeneration.

d. Where units are replanted, the 50-foot edge next to the infected LPP trees can be planted with a non-host species or the planting of the edge can be delayed, providing the natural LPP regeneration will not interfere. A non-host species can be planted in areas of natural LPP regeneration and the LPP in the 50-foot strip can be removed during the thinning entry.

e. When thinning young stands, leave a dense barrier of trees within one half chain (33 feet) from the infected LPP overstory. This barrier should be sanitized 5 years after the infected LPP is removed. The trees will become infected with any treatment. Favor a non-host species if the edge is thinned.

f. A strip of LPP regeneration extending about one half chain (33 feet) into the regeneration unit can be removed when the infected LPP overstory trees next to the unit are removed. This treatment will remove a large percentage of regeneration in a small unit.

B. Surveys and Evaluations to collect information on the presence and intensity of DM infections.

C. Stand destruction and replacement of severely infected stands (DMR 5-6) which occur on productive sites in the forest timber base, but which have no management potential because of DM infection.

D. Sanitation thinning: In areas with LPP trees over 3 feet tall and 10 years old, the DM infection levels should be reduced by sanitation thinning about 5 years after the infected LPP overstory removal. This will allow for expression of hidden latent or suppressed infection. Dwarf mistletoe infection levels in the regeneration should be reduced during precommercial thinning.

The "Flow Chart" (see Exhibit 1, FSM 3462.12--2, 3/83 R-4 SUPP 3) can be used to determine which treatment method should be used in areas not mentioned.

II. **Treatments not funded by FPM**

A. Schedule clearcuts adjacent to units before the regeneration is infected.

1. Between or next to long narrow units.
2. Adjacent to units less than 20 acres in size.
3. Adjacent to units greater than 20 acres in size.
4. Between units and natural barriers.
5. Include peninsulas extending into the regeneration.

B. Utilize natural or manmade barriers when lining out sale boundaries.

C. Discriminated against infected LPP trees during routine resource management activities (timber harvest, site preparation, or TSI) for further DM control before the regeneration is 3 feet tall or 10 years old.

Dwarf mistletoe control treatment is not recommended in mature stands heavily infected with DM where clearcutting or burning is not an option.

When wildlife or other considerations require a partial-cut in a stand, the removal** of only infected LPP trees could meet the objective in areas where non-host trees are abundant.

** Important considerations when removing or killing LPP trees: Felling is preferred to poisoning or girdling because it guarantees trees will be killed. Trees effectively girdled with a chain saw are not wind-firm and will fall at random. Directional felling and skidding should be used to reduce the damage to the remaining non-host trees.

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